2010 ANNUAL REPORT OF HATCHERY EVALUATION ACTIVITIES FOR SPRING CHINOOK SALMON AT DWORSHAK AND KOOSKIA NATIONAL FISH HATCHERIES

Brood Years 2008, 2009, and 2010

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DISCLAIMER

Data in this report is as complete and accurate as possible at the time of printing. However, because of the life history complexity of spring Chinook salmon and the mixed stock fisheries in the Clearwater River, data is provisional and subject to future revision and corrections, especially in regards to the adult returns to the rack and harvest. All questions about the validity or precision of information in this report should be directed to the Idaho Fishery Resource Office, Dworshak Fisheries Complex, U.S. Fish and Wildlife Service, (208)-476-7242.

Introduction

Dworshak National Fish Hatchery (NFH) is located at the confluence of the North Fork and the main stem Clearwater River near Ahsahka, Idaho. Construction of the hatchery was included in the authorization for Dworshak Dam and Reservoir (Public Law 87-847, October 23, 1962) to mitigate for losses of steelhead (*Oncorhynchus mykiss*) caused by the dam and reservoir. The hatchery was designed and constructed by the U.S. Army Corps of Engineers and has been administered and operated by the U.S. Fish and Wildlife Service since the first phase of construction was completed in 1969. In 1982 thirty 8-ft by 80-ft raceways were constructed under the Lower Snake River Compensation Plan (LSRCP) to provide rearing facilities for spring Chinook salmon (*O. tshawytscha*). The production program is designed to return 9,135 adult spring Chinook salmon to Lower Granite Dam by rearing and releasing 1.05 million spring Chinook salmon smolts into the Clearwater River annually.

Kooskia NFH is located about 1.5 miles east of Kooskia, Idaho, 0.5 miles upstream of the confluence of Clear Creek and the Middle Fork Clearwater River. In 1978, Kooskia NFH was included as part of the Dworshak Fishery Complex. The production program at Kooskia NFH is a U.S. Fish and Wildlife Service hatchery constructed to mitigate for water development programs in the Columbia River basin. Currently, the program calls for the release of 600,000 spring Chinook salmon smolts annually to provide sport and Tribal harvest opportunities in the Clearwater River. Because of production constraints, temperature considerations, and other factors, Kooskia NFH brood stock are held and spawned at Dworshak NFH. Dworshak NFH provides initial incubation of eggs for Kooskia NFH until the eye-up stage at which point they are enumerated and transported to Kooskia NFH for final rearing.

This report includes both Dworshak and Kooskia data on the stock origin and history of the programs, the smolts releases and emigration performances for Brood Year 2008 (released in 2010) and the marking and tagging for Brood Year 2009 (to be released in 2011). We also review the age composition of the rack returns, estimates of the sport and Tribal harvest, and estimates of smolt-to-adult survival for Chinook that returned in 2010 (Brood Years 2005, 2006, and 2007). The predictions made for the 2010 adult return to each hatchery are reviewed and pre-season predictions for the adult returns to each hatchery in 2011 are presented.

Brood Stock Origin and History

Dworshak NFH

The Dworshak NFH spring Chinook salmon program was initially started using spring Chinook salmon stock from the Leavenworth and Little White Salmon NFH programs. Eggs were transferred from these facilities to Dworshak NFH and made up the smolt releases from 1983 to 1986 (**Table 1**). Since these stocks were very strongly influenced by transfers from Carson NFH to Leavenworth and Little White Salmon NFHs, the early Dworshak spring Chinook salmon stock was considered a Lower Columbia River derivative. The spring Chinook salmon program for brood years 1985 and 1986 consisted entirely of eggs that had been transferred from Rapid River State Fish Hatchery (SFH). Rapid River State Fish Hatchery used spring Chinook salmon trapped at Hells Canyon Dam (considered an upper Snake River stock) as an original parent stock. Thus, smolts released from Dworshak NFH in 1987 and 1988 were entirely Rapid River stock, shifting the program away from using the Lower Columbia River Chinook stock. In the 21 years since 1988, Dworshak NFH has maintained its program from returns to its own rack, with the exception of two years when the program was below full production. In 1995, releases from Dworshak NFH were one third Kooskia stock spring Chinook salmon. Then in 2001 about one third of the Dworshak release was Rapid River stock (Lookingglass Fish Hatchery adults collected at Lower Granite Dam). The recent returns to Dworshak NFH (1989 and later) are referred to as Dworshak stock, since they are progeny of returns to Dworshak NFH, rather than direct products of transfers of Rapid River stock.

Table 1. Brood stock history of Dworshak NFH spring Chinook salmon smolts directly released from the hatchery, 1983-2010. (RR = Rapid River, KK = Kooskia, DW = Dworshak, LE = Leavenworth, LW = Little White Salmon).

Release Year	Brood Stock Composition
1983	75% LW, 12% RR, 13% LE
1984	100% LE
1985	68% LW, 32% LE
1986	100% LE
1987 – 1988	100% RR
1989 – 1994	100% DW
1995	66% DW, 34% KK
1996 – 2000	100% DW
2001	64% DW, 36% RR
2002-2010	100% DW

Kooskia NFH

The Kooskia NFH spring Chinook salmon program was started using a wide variety of stocks from the Lower Columbia River and Rapid River SFH. However, from 1973 through 1980, smolt releases had a very strong Lower Columbia River stock influence. Egg transfers of Lower Columbia River stock from Dworshak NFH in 1985 and 1986 resulted in smolt releases in 1987 and 1988 that were a mixed stock, referred to as Clearwater stock (**Table 2**). Since the Kooskia NFH program already had stock made up primarily of Lower Columbia River derivatives, the resultant program (1989 and later) retained that lineage, but was referred to as Kooskia stock. Length frequency data, ocean age class at return, and allele frequencies (Elliot and Pascho 1994) all supported a distinction between Dworshak and Kooskia stocks.

In April 2007, 178,678 Dworshak stock smolts (reared at Kooskia) were released from Kooskia NFH to fulfill the smolt release goal at that hatchery and to evaluate any differences in run timing between Kooskia and Dworshak stocks. All the Dworshak NFH stock were marked with either coded-wire or blank wire tags in order to identify them when they returned. The I-Ocean adults returned in the spring of 2008 and the II-Ocean adults returned in the spring of 2009. Data for I and II-Ocean adult returns suggested that there was essentially no difference in the run timing of the two stocks. A complementary analysis using PIT tag arrival data at Bonneville and Lower Granite dams for return years 2008 and 2009 supported this conclusion. However, the evaluation was terminated with the Co-Manager's agreement in 2009 to implement a change in brood stock management at Kooskia NFH. Rather than use only Kooskia stock for brood stock, the decision was made to not discriminate between different stocks that return to Kooskia NFH when selecting fish for brood stock. Thus, adults returning from releases made in 2007 and 2009 from Kooskia NFH, from Dworshak NFH stock, and the Idaho Department of Fish and Game program at Powell will be included into the brood stock for spawning in the future. Starting with the progeny of brood stock collected and spawned in 2009, the new stock will again be referred to as Clearwater stock (CL) (scheduled for release in 2011). Those adults identified as having been naturally spawned in Clear Creek, or as part of the Idaho Salmon Supplementation (ISS) program (Bowles *et. al* 1991), will be released above the weir to spawn naturally.

Table 2. Brood stock history of Kooskia NFH spring Chinook salmon smolts directly released from the hatchery, 1971-2010. (RR = Rapid River, KK = Kooskia, LE = Leavenworth, SS = South Santiam, CL = Clearwater, LW = Little White Salmon, CA = Carson, WR = Wind River, SF=South Fork Clearwater, P=Powell[1]).

Release Year	Brood Stock Composition
1971	86% RR,14% WR
1972	100% RR
1973 - 1974	100% CA
1975	58% RR, 42% CA
1976	100% SS
1977	84% CA, 11% KK, 5% LW
1978	75% RR, 25% CA
1979	69% KK, 31% CA
1980	31% KK, 69% CA
1981	64% CA, 19% KK, 17% RR
1982	100% CA
1983	65% KK, 35% LE
1984	89% KK, 11% RR
1985 - 1986	100% KK
1987 - 1988	100% CL
1989 - 2006	100% KK
2007	69% KK, 31% DW
2008	100%KK
2009	62%KK, 15% DW, 23% P
2010	73%KK , 15 %P, 12% SF

[1] Powell stock are progeny from the IDFG LSRCP Program located on Walton Creek in the Lochsa River, a tributary of the Clearwater River.

Brood Year 2008

Brood Year 2008 was established with the adult returns to Dworshak and Kooskia NFHs in 2008 (Dworshak National Fish Hatchery 2008). Incubation and early rearing was completed in late spring 2009. Juveniles were coded-wire tagged for evaluation of adult contributions and were re-stocked into raceways at final rearing densities in August, 2009. Final rearing was completed during the winter of 2009/2010 and smolt releases were completed in the early spring of 2010.

Smolt Releases

In March 2010, the Idaho FRO began monitoring flows and river conditions in the main stem Clearwater River and at Lower Granite Dam to determine the optimum time for smolt releases. By March 15, the mean daily inflow of the Snake River into Lower Granite Reservoir and the mean daily flow of the main stem Clearwater River at the Orofino bridge were about half of the 10-year average, the lowest flows observed in the past 20 years. The forecast at that time was for conditions to remain about the same for the next couple of weeks. The Idaho FRO recommended delaying releases until April 14/15, or as long as possible to provide an opportunity for flows to increase. By the last week in March, flows in the Clearwater and Snake rivers had increased significantly due to rainstorm events, but were still below the 10-year average. Even so, the managers decided that circumstances were favorable for a release on March 31, 2010.

Dworshak NFH released a total of 1,109,195 BY08 spring Chinook salmon smolts during the evening of March 31. Mean total length at the time of release was 148 mm. Arrangements were made with the U.S. Army Corps of Engineers to increase flow in the North Fork Clearwater River from 1,200 cfs to 5,000 cfs on that day, to help move the fish into the main stem Clearwater River.

Kooskia NFH released a total of 632,330 Kooskia stock spring Chinook salmon smolts at 6:00 pm on March 30, 2010 during a single release into Clear Creek. Mean total length at release was 128 mm.

The Idaho Department of Fish and Game released 229,605 Powell stock spring Chinook salmon into Clear Creek on March 25 and 26, 2010 as part of their LSRCP program. Adults returning to Clear Creek from this release will be incorporated into the Kooskia NFH broodstock program. All the fish were marked by removing the adipose fin. A total of 117, 616 were tagged with code-wire and 18,178 were tagged with PIT-tags.

These fish will return to their respective hatcheries in 2011, 2012, and 2013 as I-, II-, and III-Ocean adults.

Emigration Performance and Survival

PIT-tags are used to help evaluate the effectiveness of the production programs at both Dworshak and Kooskia NFH. Information is collected at the various dams throughout the lower Snake and Columbia rivers and is used to provide estimates on emigration time and survival. PIT-tags also provide real-time data on adult return timing and a means to assess total return as fish are detected at Columbia and Snake river dams.

Dworshak NFH - A total of 51,423 pit-tagged smolts were released at Dworshak NFH as part of the Comparative Survival Study being conducted by the Fish Passage Center (FPC). The Comparative Survival Study evaluates the effectiveness of transporting smolts past the Snake and Columbia River dams as opposed to migration through the hydro system.

The migration time of smolts released from Dworshak NFH to Lower Granite Dam ranged from 7 days to 73 days with a mean travel time of 31 days. Ten percent arrived at Lower Granite Dam within 22 days; 50% and 90% arrived within 27 days and 36 days, respectively. Smolts that migrated through the hydro system arrived at Bonneville Dam on average 46 days after release. Survival probabilities through the Federal Columbia River Power System (FCRPS) were calculated using SURvival under Proportional Hazards 2.1 (SURPH) (Lady *et al*. 2001). The estimated survival for BY08 spring Chinook smolts to Lower Granite Dam was 89.2% (se=0.0192). The overall estimated survival to Bonneville Dam was 78% (se=0.0912).

Kooskia NFH - A total of 14,543 PIT-tagged smolts were released as part of the Hatchery Evaluation Program at Kooskia NFH. The migration time of smolts released from Kooskia NFH to Lower Granite Dam ranged from 7 days to 73 days with a mean travel time of 31 days. Ten percent arrived at Lower Granite Dam within 22 days; 50% and 90% arrived within 24 days and 30 days, respectively. Smolts that migrated through the hydro system arrived at Bonneville Dam on average 46 days after release. Survival probabilities through the FCRPS were calculated using SURvival under Proportional Hazards 2.1 (SURPH) (Lady *et al*. 2001). The estimated survival for BY08 spring Chinook smolts to Lower Granite Dam was 76.3% (se=0.0350). The overall estimated survival to Bonneville Dam was 81.8% (se=0.2621). Since we know it's impossible for survival to Bonneville Dam to be higher than survival to Lower Granite Dam, the problem is likely the result of the large standard error in the Bonneville Dam survival estimate.

Coded-Wire Tagging to Determine Adult Contribution and Survival

Coded-wire tags are used to estimate the contribution of adults to various commercial, sport and Tribal fisheries in the ocean, in the lower Columbia River, in the lower Snake River, and in the Clearwater River when they return as adults. Coded-wire tag groups are also used to represent treatment and control groups for both on- and off-station research projects and to provide information on the effectiveness of alternative production methods.

Two tag codes were used to represent the smolt releases at Dworshak NFH. At Kooskia NFH, four CWT groups were used to represent the smolts released from Kooskia NFH (**Table 3**).

Just prior to release, the coded-wire tag retention rate was estimated in order to provide a more accurate number of coded-wire tagged smolts released. Two hundred and fifty fish from each tag code group were checked for coded-wire tags. The retention rates for both Dworshak NFH and Kooskia NFHs were 99.99%.

Table 3. Coded-wire tag release information for Brood Year 2008 spring Chinook salmon released from Dworshak and Kooskia NFHs in 2010.

Hatchery	Tag Code	Number of Tags	Number of Unmarked Fish	Mark Rate	Purpose
DNFH	054685	59,652	491,813	0.12	Contribution, Raceways A5 and A6
	054686	59,331	498,399	0.12	Contribution, Raceways B20 and B21
KNFH	053486	29,602	523,822[1]	0.21	Contribution, Run Timing, BP02
	05 3487	29,602			Contribution, Run Timing, BP 02
	053488	29,591			Contribution, Run Timing, BP02
	050982	19,713			Contribution, Run Timing, BP02

[1] The entire Kooskia BY08 production is represented by these 4 CWT codes combined.

Brood Year 2009

Brood Year 2009 was established with the adult returns to Dworshak and Kooskia NFHs in 2009 (Dworshak National Fish Hatchery 2009). Incubation, early rearing and coded-wire tagging was completed in 2010. **Table 4** lists the tag codes, the number tagged, and the estimated number of unmarked fish each code represents at each hatchery, and the estimated mark rate. The final release numbers will be reported in the 2011 annual report. Brood Year 2009 will be released in the spring of 2011.

Table 4. Coded-wire tag release information for Brood Year 2009 spring Chinook salmon scheduled for release from Dworshak and Kooskia NFHs in 2011.

Hatchery	Tag Code	Number of Tags	Number of Unmarked Fish	Mark Rate	Purpose
DNFH	051183	67,074	470,407	0.14	Contribution, Raceways A7 and A8
	051186	67,111	470,407	0.14	Contribution, Raceway B24 and B25
KNFH	055067	108,398	498,586[1]	0.22	Contribution, BP05
	05	50,016		0.10	Contribution, BP04

[1] The entire Kooskia BY09 production is represented by these 2 CWT codes combined.

Early Rearing Container Evaluation

In September, 2008, the production staff at Dworshak NFH submitted a proposal to the Dworshak Complex Hatchery Evaluation Team (HET) for the evaluation of several different styles of early rearing containers for spring Chinook salmon in lieu of using raceways. The study was designed to continue for two to three years with the intention of making recommendations on the optimum container to use for early rearing. Eventually, plans call for the construction of a separate nursery for the spring Chinook salmon program. The study was initiated in the spring with Brood Year 2008. Fry were stocked directly from the nursery into seven circular tanks, four stainless steel rectangular tanks, and into one raceway used as a control. Growth, mortality, and water quality were monitored from March through April, 2009.

The study was continued in 2010 using Brood Year 2009. A report of progress for the study has been drafted and submitted to Production.

Brood Year 2010

Brood Year 2010 was established with the adult returns to Dworshak and Kooskia NFHs in 2010 (Dworshak National Fish Hatchery 2010).

Adult Returns to the Clearwater River

The numbers of Dworshak and Kooskia NFH origin adult spring Chinook salmon that returned to the Clearwater River in 2010 are challenging to determine because of the mixed stock fisheries and harvests that occur in the Clearwater River basin. The adults that enter the Clearwater River each year originate from smolt release programs at Dworshak NFH, Kooskia NFH, Idaho Department of Fish and Game (IDFG) facilities at Powell, Red River, and Crooked River, and Nez Perce Tribal Hatchery program releases in Lolo Creek, Newsome Creek, and the Selway River. The challenge is further complicated because the adult return in any one year is comprised of multiple age groups from smolts released the previous three years. Thus, the adult return to the Clearwater River in 2010 is comprised of smolts released in 2007, 2008, and 2009.

The estimated return of adults for Dworshak and Kooskia NFH stocks is based on the numbers of adults that enter the racks at Dworshak and Kooskia NFHs, estimates of the contribution of these two stocks to the sport and Tribal harvests, and estimates of the number of fish that escape to the river, the un-harvested component of the run.

Estimates of the numbers of adults and jacks harvested in the sport fishery for Dworshak and Kooskia hatcheries are based on expanded numbers of coded-wire tags collected during sport fish harvest surveys by the IDFG. These tags are expanded by tagging and sample rates, across multiple creel survey river sections (Cassinelli, IDFG personal communication). The Nez Perce Tribe provides estimates of tribal harvest, most of which occurs at the ladder at Dworshak NFH and in Clear Creek below the adult trap at Kooskia NFH.

For 2010, the Idaho FRO, in conjunction with the Idaho Department of Fish and Game, developed a methodology to estimate the total return of Dworshak stock to the Clearwater River using expansion factors based on the ratios of PIT-tagged to untagged adults in the hatchery rack and at Lower Granite Dam (Peery *et al*. 2011). Using the estimated total, the escapement (those fish not returning to a rack or harvested in a fishery) was calculated by subtracting the rack return and harvest estimates. At this time, the methodology is still under development and evaluation. Numbers reported are provisional and subject to change in future reports. PIT tag expansions used in adult returns are likely biased low due to possible tag loss and/or differential mortality during the period from time of release to time of adult return. Currently, IDFG is analyzing the degree of any possible bias in hopes of being able to correct these expansions in the future (John Cassinelli, IDFG, Personal Communication).

We could not use the method outlined in Peery *et al*. (2011) to estimate the adult return of Kooskia NFH stock over Lower Granite Dam because we did not recover any adult PIT tags in the rack at Kooskia. John Cassinelli calculated an estimate of the adult return of Kooskia stock

to Lower Granite Dam by expanding the number of adult PIT tags detected by the marked to unmarked juvenile PIT-tag marking rate (John Cassinelli, IDFG, Personal Communication).

Dworshak NFH - The adult ladder at Dworshak NFH was opened on June 1 and was operated continuously through July 25. On a bi-weekly basis starting July 13, adults were moved from the collection pond to the spawning room where they were checked for tags, measured for length, and transferred to the adult holding ponds to mature for spawning. Four inventories were conducted from July 13 through August 31. In addition, three adult mortalities were taken from the adult holding pond. **Table 5** lists the numbers of adult spring Chinook inventoried on each date. A total of 1,225 Chinook entered the rack at Dworshak NFH in 2010, 1,476 were harvested in the sport fishery, and the Tribal harvest was estimated to be 1,077. The total return of Dworshak NFH stock spring Chinook salmon to Lower Granite Dam was estimated to be 6,950. Using this estimate and subtracting the rack return and the estimated sport and tribal harvests, the escapement was estimated to be 3,177 (**Table 6**). The 2010 return was a little higher, compared to the previous 5-year average, although the comparison is somewhat biased since estimates of escapement are not available for returns in 2006 to 2008. The historical numbers from 1987 through 2010, are listed in **Appendix Table 1.**

Table 5. Ladder operation for BY10 SCS trapped at Dworshak NFH (Dworshak National Fish Hatchery 2010).

Date of Inventory	Number of Fish
13 July	366
27 July	782
11 August	63
31 August	11
Mortalities	3
Total	**1,225**

Table 6. Adult returns of Dworshak NFH adult spring Chinook salmon to the Clearwater River from 2006-2010.

Return Year	Rack Return	Sport Harvest	Tribal Harvest	Escapement	Total Run[1]
2006	1,354	589	392	na	2,335
2007	2,110	256	198	na	2,564
2008	1,857	1,109	159[2]	na	3,125
2009	2,171	1,373	354	848	4,746
2010	**1,225**	**1,476**	**1,077[3]**	**3,177**	**6,950**
Mean	1,728	960	436		3,944

[1] Total Run for 2006 to 2008 does not include an escapement estimate.
[2] Total number based on angler interview and is not an expanded estimate.
[3] Includes 17 jacks.

Kooskia NFH - The adult trap at Kooskia NFH was opened May 10, 2010 and was operated until June 29, 2010 (Kooskia NFH 2010). Adults were removed from the holding pond, measured for length, checked for marks and tags, and then transported to Dworshak NFH for holding until mature for spawning. Adults identified as natural fish were passed above the weir to spawn naturally as part of the ISS project. Eight inventories were conducted from May 20 through June 30. The total rack return was 807, including 7 fish passed above the weir to spawn naturally and one trap mortality. A total of 799 Chinook were transported to Dworshak NFH. **Table 7** lists the numbers of fish inventoried on each date. Eight hundred and seven Chinook entered the rack at Kooskia NFH in 2010, 1,327 were harvested in the sport fishery and 1,156 were taken in the Tribal fishery. The total return of Kooskia NFH stock spring Chinook salmon to Lower Granite Dam was estimated to be 3,928. Using this estimate and subtracting the rack return and the estimated sport and Tribal harvests, the escapement was estimated to be 489 **(Table 8).** The 2010 return was much higher, compared to the recent 5-year average, although the data is somewhat biased since previous years do not include estimates of escapement for returns from 2006 to 2009. The historical numbers, from 1987 through 2010, are listed in **Appendix Table 2.**

Table 7. Ladder operation for BY10 SCS trapped at Kooskia NFH (Kooskia National Fish Hatchery 2010).

Date of Inventory	Transported to Dworshak	Passed Upstream	Tribal Subsistence	Trap Mortalities
20 May	111			
25 May	23			
7 June	63			
22 June	133	2		
23 June	95	1		
28 June	130	1		
29 June	150	2		
30 June	94	1		1
Total	**799**	**7**	**0**	**1**

Table 8. Adult returns of Kooskia NFH adult spring Chinook salmon to the Clearwater River from 2006-2010.

Return Year	Rack Return	Sport Harvest	Tribal Harvest	Escapement	Total Run[1]
2006	670	73	65	na	808
2007	589	128	166	na	883
2008	816	623	132[2]	na	1,571
2009	590	188	123	na	901
2010	**807**	**1,327**	**1,156[3]**	**638**	**3,928**
Mean	694	468	304	na	1,618

[1] Does not include an escapement estimate for 2006 to 2009 returns.
[2] Actual harvest estimate not reported. Idaho FRO estimate based on the average harvest reported for 2005, 2006, 2007, and 2009.
[3] Includes 12 jacks.

Age Composition of the Hatchery Rack Return

Adult spring Chinook salmon return after spending 1, 2, or 3 years in the ocean. A very small number of individuals return as 0's, having returned to the hatchery the same year as they were released as smolts, and in some very exceptional years, some fish return after 4 years in the ocean. The nomenclature used to describe the age at return is I-, II-, or III-Ocean fish. Scales are commonly used to determine age in fish, but with spring Chinook salmon at Dworshak and Kooskia NFHs, we have observed that scales are often re-absorbed and are severely degenerated by the time the adults enter the hatchery. Therefore, scale interpretation is very difficult if not impossible. In lieu of scales, our office has developed an alternative method based on the lengths of individuals of known age using coded-wire tag information accumulated over the past 20 years. Fork length categories for each class is as follows: I-Oceans are 56 cm or less, II-Oceans are 57 through 81 cm, and III-Oceans are larger than 81 cm, fork length. Males are generally larger than females on average. However, attempts to break down the run into age classes by sex have been discontinued because of the difficulty in distinguishing males and females at the time of inventory. Sexually distinguishing characteristics do not usually begin to develop until the time of sexual maturity and spawning.

Dworshak NFH - Age composition for spring Chinook salmon returning to the Dworshak NFH rack is listed in **Table 9**. The 2010 return year is not very typical of the previous 5-year average in that the percentage of I-Ocean age class was lower and the percentage of the III-Ocean age class was higher. The last five return years from 2006 to 2010 exhibit a lot of annual variation in age composition. At the same time, the age composition of BY10 is very close to the historical average for years 1984 to 2010 listed in **Appendix Table 3.**

Table 9. Age composition of spring Chinook salmon adults returning to the Dworshak NFH rack, 2006-2010.

Return Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Rack Return
2006	62	5	1,136	84	156	11	0	1,354
2007	702	33	809	39	599	28	0	2,110
2008	319	17	1,201	65	337	18	0	1,857
2009	726	33	1,200	55	245	12	0	2,171
2010	142	12	798	65	285	23	0	1,225
Mean	**390**	**20**	**1,017**	**62**	**321**	**18**	**0**	**1,743**

Kooskia NFH - Age composition for spring Chinook salmon returning to Kooskia NFH is listed in **Table 10.** The age composition for the 2010 return was atypical of the average for the last 5 years in that the percentages of the I- and III-Ocean age classes were lower while the II-Ocean age class was higher. The historical age composition from 1972 to 2010 is listed in **Appendix Table 4**. The average age composition for the last five years is very similar to the historical average from 1972 to 2010 (**Appendix Table 4**).

Table 10. Age composition of spring Chinook salmon adults returning to the Kooskia NFH rack 2006-2010.

Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Rack Return
2006	7	1	617	92	46	7	0	670
2007	257	44	148	25	184	31	0	589
2008	107	13	647	79	62	8	0	816
2009	155	26	369	63	65	11	0	589
2010	27	3	731	91	49	6	0	807
Mean	**111**	**17**	**502**	**70**	**81**	**13**	**0**	**694**

Smolt-to-Adult Survival

The ability of smolts to successfully migrate to the ocean and return as adults is an important and useful measure of smolt quality and program success. The measure is referred to as the Smolt-to-Adult Return rate, or SAR. Spring Chinook salmon spend one, two, or three years in the ocean before returning as adults. Thus, estimating SAR for any given brood year requires determining the number of each age class within each respective adult return for the next three years. The adults that returned in 2010 were composed of I-Ocean adults that were released as smolts in 2009 (brood year 2007), II-Ocean adults that were released as smolts in 2008 (brood year 2006), and III-Ocean adults that were released as smolts in 2007 (brood year 2005). With the return of the III-Ocean adults in 2010, estimating the SAR for Brood Year 2005 can be completed (I-Ocean adults returned in 2008, II-Ocean adults returned in 2009, and III-Ocean adults returned in 2010). In addition, we have the I-Ocean adult returns for Brood Year 2007 and the II-Ocean adult returns for Brood Year 2008.

Estimating SAR is further complicated by having to account for the numbers of those age classes distributed among various fishery programs that make up the total adult return; adults returning to the respective hatchery rack, the harvest in sport and Tribal fisheries, research, other programs where adults may be accounted for, and the escapement in the Clearwater River. Prior to 2009, the estimated numbers of Dworshak and Kooskia NFH spring Chinook in the sport and Tribal harvest were not reported by age class. In those years, the age classes were estimated by applying the age class percentages in the hatchery rack, making the assumption that harvest was in direct proportion to the rack return. In 2009, the IDFG and the Nez Perce Tribe began using PIT-tag and coded-wire tag expansion methods to estimate the age composition of the sport and Tribal harvests and calculated estimates for adults (II- and III-Ocean fish) and jacks (I-Ocean fish).

Historically, the total return for a single brood year was estimated by combining the rack return and harvest estimates. The escapement (adults not returning to a rack, weir, or harvest) was not accounted for. In conjunction with the Idaho Department of Fish and Game, the Idaho FRO has developed a methodology to estimate the total return of Dworshak stock to the Clearwater River using expansion factors based on the ratios of PIT-tagged to untagged adults in the hatchery rack and at Lower Granite Dam (Peery *et al*. 2011).

Dworshak NFH - **Table 11** lists the numbers of Dworshak NFH spring Chinook salmon of each age class in the hatchery rack (from **Table 9**), the sport fishery, the Tribal fishery, and escapement for 2010. The Idaho Department of Fish and Game reported a total 1,439 II and III-Ocean adults of Dworshak NFH stock harvested in the 2010 sport fishery. The Nez Perce Tribe reported a total of 12 jacks (I-Ocean adults) and 1,060 II and III-Ocean adults of Dworshak NFH stock harvested in the Tribal fishery in the North Fork Clearwater River. The percent of II and III-Ocean adults in the Dworshak NFH rack (I-Ocean adults excluded) was 73.5% and 26.5%, respectively. These percentages were applied to the Tribal harvest totals to estimate the II and III-Ocean ages classes in the Tribal harvest, respectively. We used PIT-tag information for adults returning over Lower Granite Dam and returning to the rack at Dworshak NFH to estimate the total adult return of spring Chinook salmon to the Clearwater River by stock. For Dworshak NFH, the estimate was 6,950. By subtracting the hatchery rack, the sport harvest, and the Tribal harvest from the estimated total return, the escapement is estimated to be 236 I-Oceans, 2,692 II-Oceans, and 249 III-Oceans, for a total of 3,177.

Table 11. The estimated number of Dworshak NFH spring Chinook salmon adults of each ocean age class in the various fishery programs in the Clearwater River for the 2010 adult return.

Program	I-Ocean BY07	II-Ocean BY06	III-Ocean BY05	Total
Hatchery Rack	142	798	285	1,225
Sport Harvest	37	1,397	42	1,476
Tribal Harvest	12	779	281	1,072
Escapement	236	2,692	249	3,177
Total	**427**	**5,666**	**857**	**6,950**

Table 12 lists the numbers of smolts released, and numbers and percent survival of adults returning by age class for Brood Years 2005 through 2008 (release years 2007 to 2010). These include harvest estimates from the sport and Tribal fisheries and estimates of escapement for those years when it is available. The historical numbers, from Brood Years 1986 to 2008 (release years 1988 to 2010) are listed in **Appendix Table 5**. Estimated smolt-to-adult-return, or

survival, for Brood Year 2005, released as smolts in 2007, was 0.3503%, just slightly higher than the 18 year average of 0.3440% for Brood Years 1984 to 2005.

Table 12. Brood Year, release year, number of smolts released, and the numbers and percent survival of adult returns to Dworshak NFH by age class for Brood Years 2005 to 2008. Numbers of fish and percentages include the sport and Tribal harvests and escapement for those years when the data is available.

Brood Year	Release Year	Smolts Released	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% Return)	Total (% Return)
2005	2007	963,211	506 (0.0530%)	2,516 (0.2610%)	857 (0.089%)	3,879 (0.4030%)
2006	2008	939,000	1,847 (0.1970%)	5,666 (0.6034%)		
2007	2009	1,014,748	427 (0.0420%)			
2008	2010	1,109,195				

Kooskia NFH - **Table 13** lists the numbers of Kooskia NFH spring Chinook salmon of each age class in the hatchery rack (from **Table 10**), the sport fishery, the Tribal fishery, and escapement during 2010. The Idaho Department of Fish and Game reported a total 1,327 harvest of Kooskia NFH stock. The Nez Perce Tribe reported a total of 1,156 fish of Kooskia NFH stock harvested in the Tribal fishery in Clear Creek. The percent of II and III-Ocean adults in the Kooskia NFH rack (I-Ocean adults excluded) was 93.7 and 6.30%, respectively. These percentages were applied to the Tribe's harvest total to estimate the II and III-Ocean ages classes in the Tribal harvest.

For Kooskia NFH, the estimated adult return over Lower Granite Dam was 3,666 adults (II- and III-Ocean) and 262 Jacks (I-Ocean), or 3,928, total. We applied the Kooskia NFH rack return percentages to their estimate to obtain estimates for II- and III-Ocean adults individually. By subtracting the hatchery rack, the sport harvest, and the Tribal harvest from the estimated total return, the escapement is estimated to be 195 I-Oceans, 371 II-Oceans, and 72 III-Oceans, or 638, total.

Table 13. The estimated number of Kooskia NFH spring Chinook salmon adults of each ocean age class in the various fishery programs in the Clearwater River for the 2010 adult return.

Program	**I-Ocean BY07**	**II-Ocean BY06**	**III-Ocean BY05**	**Total**
Hatchery Rack	27	731	49	807
Sport Harvest	28	1,261	38	1,327
Tribal Harvest	12	1,072	72	1,156
Escapement	195	371	72	638
Total	**262**	**3,435**	**231**	**3,928**

Table 14 lists the numbers of smolts released and the estimated survival of each returning age class for Brood Years 2005 to 2008 (Release Years 2007 to 2010). These include harvest

estimates from the sport and Tribal fisheries. The historical numbers, for Brood Years 1986 to 2010, are listed in **Appendix Table 6**. Estimated smolt-to-adult-return, or survival, for Brood Year 2005, released as smolts in 2007, was 0.17%, about half of the 18 year average of 0.34% for Brood Years 1986 to 2005.

Table 14. Release year, number of smolts released, and the numbers and percent survival of adult returns to Kooskia NFH by age class for Brood Years 2005 to 2008. Numbers of fish and percentages include the sport and Tribal harvests and escapement for those years when the data is available.

Brood Year	Release Year	Smolts Released	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% Return)	Total (% Return)
2005	2007	569,565[1]	181 (0.0318%)	572 (0.100%)	231 (0.0290%)	984 (0.1730%)
2006	2008	649,601	246 (0.0378%)	3,435 (0.529%)		
2007	2009	603,679[2]	262 (0.0434%)			
2008	2010	632,330				

[1] 178,687 were of Dworshak NFH stock, all marked with coded-wire tags.
[2] 161, 649 were of Dworshak NFH stock, all marked with coded-wire tags.

Adult PIT Tag Interrogations

During the 2010 migration, 210 spring Chinook adults of Dworshak origin were interrogated at Lower Granite Dam: 5 from BY05, 189 from BY06, and 16 from BY07. Thirty-three (15.7%) of those were collected in the Dworshak NFH adult ladder. The first detection date for Dworshak origin spring Chinook at Lower Granite Dam was April 11, 2010. The last detection was on June 28, 2010.

Sixty Kooskia origin spring Chinook adults were interrogated at Lower Granite Dam in 2010: 1 from BY05, 55 from BY06, and 4 from BY07. No PIT tagged Chinook were collected at the Kooskia NFH weir. The first detection date for Kooskia origin spring Chinook at Lower Granite Dam was April 21, 2010. The last detection was on May 29, 2010.

2010 Run Predictions

Dworshak NFH - The total number of spring Chinook salmon that we predicted would return to Dworshak NFH and associated fisheries in 2010 was 9,137. Actual number of Dworshak NFH Chinook salmon estimated to have returned to the Clearwater River was 6,950 (**Table 11**). The greatest disparity was in the number of II-Ocean fish returning, which was over-estimated by 2,540 fish. **Table 15** lists the predicted returns and the expanded actual returns of all three age classes of adults in 2010.

Table 15. Predicted and calculated returns of Dworshak NFH spring Chinook salmon by ocean age class, 2010. Includes sport and tribal harvest estimates.

Ocean Age Class	Prediction	Total Return
I-Ocean	408	427
II-Ocean	8,210	5,666
III-Ocean	519	857
Total	9,137	6,950

Kooskia NFH - Based on 2008 draft tribal harvest, sport harvest data, and rack returns and ocean conditions during emigration; the 2010 forecasted return for Kooskia NFH adult spring Chinook to the Clearwater River was 1,807 fish (U.S. Fish and Wildlife Service *et al*. 2010, Table 7a, 2010 Clearwater AOP). The actual number that returned to the Clearwater River in 2010 was 3,928. Unlike the estimated return for the Dworshak NFH stock, the Kooskia NFH stock returned at a much higher rate than was predicted. **Table 16** lists the predicted and the expanded actual returns of all three age classes of adults in 2010. In recent years, predictions for Kooskia NFH have tended to be more accurate than those for Dworshak NFH. This was not the case for 2010.

Predictions were used for preliminary management purposes such as potential harvest, brood stock collection adequacy, and planning for adult outplanting so we will continue to work to improve prediction methods.

Table 16. Predicted and calculated returns of Kooskia NFH spring Chinook salmon for 2010 by ocean age class, including estimates of sport and tribal harvest and escapement.

Ocean Age Class	Prediction	Total Return
I-Ocean	116	262
II-Ocean	1,423	3,435
III-Ocean	268	231
Total	1,807	3,928

2011 Run Predictions

Our forecast for the 2011 spring Chinook salmon return to the Clearwater River from Dworshak and Kooskia NFHs is given in **Table 17**. Brood stock requirements are 1,000 adults at Dworshak NFH and 800 for Kooskia NFH (600 for the Kooskia program and 200 for the IDFG program release into Clear Creek). The Idaho Department of Fish and Game and the Nez Perce Tribe will likely open limited sport and tribal fisheries in the Clearwater River in the spring of 2011 after dam counts of PIT tagged adults provide actual estimates of returning adults.

Table 17. Predicted returns of spring Chinook salmon to the Clearwater River from the Dworshak Fishery Complex by ocean age class, 2011, including estimates of sport and tribal harvest and escapement.

Ocean Age Class	Dworshak NFH	Kooskia NFH
I-Ocean	114	313
II-Ocean	3,054	2,301
III-Ocean	0	0
Total	3,168	2,614

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Appendix Table 1. Adult returns of Dworshak NFH adult spring Chinook salmon to the Clearwater River from 1987-2010.

Return Year	Rack Return	Sport Harvest	Tribal Harvest	Escapement[1]	Total Run
1987	2,017	na	160	na	2,177
1988	1,972	na	240	na	2,212
1989	1,700	na	346	na	2,046
1990	2,042	na	514	na	2,556
1991	165	na	0	na	165
1992	370	na	160	na	530
1993	823	na	43	na	866
1994	74	na	0	na	74
1995	125	na	0	na	125
1996	963	na	24	na	987
1997	3,150	693	835	na	4,678
1998	915	99	182	na	1,196
1999	800	na	36	na	836
2000	3,202	4,095	1,173	na	8,470
2001	4,018	8,355	531	na	12,904
2002	2,157	3,542	794	na	6,493
2003	3,422	2,228	1,445	na	7,095
2004	2,356	3,608	419	na	6,383
2005	882	606	102	na	1,590
2006	1,354	589	392	na	2,335
2007	2,110	256	198	na	2,564
2008	1,857	1,109	159[2]	na	3,125
2009	2,171	1,373	354	848	4,746
2010	1,225	1,476	1,077	3,177	6,950

[1] Estimates of escapement are not available for years 1987 to 2008
[2] Total number based on angler interview and is not an expanded estimate.

Appendix Table 2. Adult returns of Kooskia NFH adult spring Chinook salmon to the Clearwater River from 1987-2010.

Return Year	Rack Return	Sport Harvest	Tribal Harvest	Escapement[1]	Total Run
1987	687	na	50	na	737
1988	595	na	72	na	667
1989	973	na	58	na	1,031
1990	1,141	na	130	na	1,271
1991	467	na	na	na	467
1992	312	na	na	na	312
1993	1,180	na	na	na	1,180
1994	232	na	na	na	232
1995	40	na	na	na	40
1996	202	na	na	na	202
1997	1,657	45	12	na	1,714
1998	408	0	20	na	428
1999	157	na	1	na	158
2000	1,581	21	10	na	1,612
2001	2,261	6,397	834	na	9,492
2002	1,037	1,544	683	na	3,264
2003	965	426	164	na	1,555
2004	718	2,195	389	na	3,302
2005	270	53	173	na	496
2006	670	73	65	na	808
2007	589	128	166	na	883
2008	816	623	132[2]	na	1,571
2009	590	188	123	na	901
2010	807	1,476	1,156	638	3,928

[1] Estimates of escapement are not available for years 1987 to 2009.
[2] Actual harvest estimate not reported. Idaho FRO estimate based on the average harvest reported for 2005, 2006, 2007, and 2009.

Appendix Table 3. Number and percent of I-, II-, and III-Ocean spring Chinook salmon adults returning to the Dworshak NFH rack from1987 to 2010. Percentages do not include unmeasured adults.

Return Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Rack Return
1984	14	17	52	63	16	20	0	82
1985	13	4	281	85	35	11	5	334
1986	78	15	346	67	91	18	0	516
1987	25	1	1,604	80	376	19	12	2,017
1988	163	8	569	29	1,240	63	0	1,972
1989	156	9	1,322	78	221	13	1	1,700
1990	7	0.3	1,892	93	135	6.7	8	2,042
1991	16	10	77	47	72	43	0	165
1992	23	6	286	82	40	12	21	370
1993	9	1	452	55	359	44	3	823
1994	3	4	30	41	41	55	0	74
1995	83	66	36	29	6	5	0	125
1996	275	28	663	69	25	3	0	963
1997	12	0.4	2,380	76	740	23.6	18	3,150
1998	11	1	176	19	728	80	0	915
1999	670	84	78	10	52	6	0	800
2000	221	7	2,827	90	104	3	0	3,202
2001	36	1	3,235	80	747	19	0	4,018
2002	62	3	1,480	69	615	28	0	2,157
2003	580	17	478	14	2,364	69	0	3,422
2004	142	6	2,077	88	137	6	0	2,356
2005	74	8	686	78	122	14	0	882
2006	62	5	1,136	84	156	11	0	1,354
2007	702	33	809	39	599	28	0	2,110
2008	319	17	1,201	65	337	18	0	1,857
2009	726	33	1,200	55	245	12	0	2,171
2010	142	12	798	65	285	23	0	1,225
Mean	171	15	969	61	366	24	3	1,511

Appendix Table 4. Number and percent of I-, II-, and III-Ocean spring Chinook salmon adults returning to the Kooskia NFH rack from1972 to 2010. Percentages do not include unmeasured adults.

Return Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Rack Return
1972	5	100	0	0	0	0	0	5
1973	5	10	45	90	0	0	0	50
1974	16	30	35	66	2	4	0	53
1975	15	5	284	87	27	8	0	326
1976	409	51	286	36	106	13	0	801
1977	333	11	2,539	84	154	5	0	3,026
1978	23	1	1,676	82	336	17	0	2,035
1979	11	3	100	27	264	70	0	375
1980	9	13	55	82	3	5	0	67
1981	1	0.4	168	68	78	31.6	0	247
1982	3	1	116	45	139	54	0	258
1983	1	0.3	231	61.7	141	38	0	373
1984	55	16	80	23	206	61	0	341
1985	26	5	449	85	54	10	0	529
1986	21	7	159	56	103	37	0	283
1987	16	2	607	88	64	10	0	687
1988	39	7	363	61	193	32	0	595
1989	107	11	717	74	142	15	7	973
1990	11	1	921	81	209	18	0	1,141
1991	10	2	98	21	350	77	9	467
1992	14	5	239	82	38	13	21	312
1993	11	1	749	64	409	35	11	1,180
1994	1	0.4	96	41.6	135	58	0	232

Appendix Table 4. Continued.

Return Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Rack Return
1995	21	52	7	18	12	30	0	40
1996	86	43	113	56	3	1	0	202
1997	7	0.4	1,523	92	127	7.6	0	1,657
1998	1	0.3	200	49	207	51	0	408
1999	72	46	28	18	57	36	0	157
2000	966	61	604	38	11	1	0	1,581
2001	28	1	2,137	95	96	4	0	2,261
2002	14	1	852	82	171	17	0	1,037
2003	97	10	71	7	797	83	0	965
2004	15	2	682	95	21	3	0	718
2005	29	11	202	75	39	14	0	270
2006	7	1	617	92	46	7	0	670
2007	257	44	148	25	184	31	0	589
2008	107	13	647	79	62	8	0	816
2009	155	26	369	63	65	11	1	590
2010	27	3	731	91	49	6	0	807
Mean	78	15	486	61	131	24	1	695

Appendix Table 5. Brood Year, release year, number of smolts released, and the numbers and percent survival of adult returns to Dworshak NFH and the Clearwater River by age class for Brood Years 1986 to 2008. Estimates include sport and Tribal harvest numbers for years when those fisheries occurred, and estimates of escapement, starting with returns in 2009 (BYs 05, 06, and 07).

Brood Year	Release Year	Smolts Released[1]	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% Return)	Total (% Return)
1986	1988	1,547,219	187 (0.012%)	2,370 (0.153%)	72 (0.005%)	2,629 (0.170%)
1987	1989	1,651,472	9 (0.001%)	77 (0.005%)	59 (0.004%)	145 (0.009%)
1988	1990	1,251,247	16 (0.001%)	417 (0.033%)	378 (0.030%)	811 (0.065%)
1989	1991	1,094,884	33 (0.003%)	476 (0.043%)	41 (0.004%)	591 (0.054%)
1990	1992	959,369	9 (0.001%)	30 (0.003%)	7 (0.001%)	46 (0.005%)
1991	1993	7,222	3 (0.042%)	36 (0.498%)	26 (0.360%)	65 (0.900%)
1992	1994	1,278,273	83 (0.006%)	679 (0.053%)	937 (0.073%)	1,699 (0.133%)
1993	1995	1,311,445	282 (0.022%)	3,708 (0.283%)	909 (.069%)	4,899 (0.374%)
1994	1996	102,903	15 (0.015%)	274 (0.266%)	56 (0.054%)	345 (0.335%)
1995	1997	53,078	13 (0.024%)	.82 (0.154%)	246 (0.463%)	341 (0.642%)
1996	1998	973,400	700 (0.072%)	7,649 (0.786%)	2,463 (0.253%)	10,812 (1.111%)
1997	1999	1,044,511	525 (0.050%)	10,372 (0.993%)	1397 (0.134%)	12,294 (1.177%)
1998	2000	1,017,873	69 (0.007%)	4,991 (0.490%)	5,299 (0.521%)	10,359 (1.018%)
1999	2001	333,120	105 (0.032%)	892 (0.268%)	269 (0.081%)	1,266 (0.380%)
2000	2002	1,000,561	904 (0.090%)	5,891 (0.589%)	1,545 (0.154%)	8,340 (0.834%)
2001	2003	1,033,982	223 (0.022%)	1,260 (0.122%)	199 (0.019%)	1,682 (0.163%)
2002	2004	1,078,923	85 (0.008%)	2,050 (0.190%)	762 (0.071%)	2,897 (0.269%)
2003	2005	1,072,359	86 (0.008%)	1,035 (0.097%)	477 (0.044%)	1,568 (0.146%)
2004	2006	1,007,738	767 (0.076%)	2,172 (0.215%)	383 (0.028%)	3,322 (0.330%)

Appendix Table 5 (Cont.).

Brood Year	Release Year	Smolts Released	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% Return)	Total (% Return)
2005	2007	963,211	506 (0.0530%)	2,516 (0.2610%)	857 (0.089%)	3,879 (0.403%)
2006	2008	939,000	1,567 (0.1669%)	5,666 (0.6034%)		
2007	2009	1,014,748	427 (0.0420%)			
2008	2010	1,109,195				

Appendix Table 6. Brood Year, release year, number of smolts released, and the numbers and percent survival of adult returns for Kooskia NFH and the Clearwater River by age class for Brood Years 1986 to 2008. Estimates include sport and Tribal harvest numbers for years when those fisheries occurred, and estimates of escapement, starting with returns in 2009 (BYs 05, 06, and 07).

Brood Year	Release Year	Smolts Released[1]	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% Return)	Total (% Return)
1986	1988	778,407	113 (0.015%)	1,026 (0.132%)	350 (0.045%)	1,489 (0.191%)
1987	1989	384,235	12 (0.003%)	98 (0.026%)	38 (0.010%)	148 (0.039%)
1988	1990	403,701	10 (0.002%)	239 (0.059%)	409 (0.101%)	658 (0.163%)
1989	1991	396,619	14 (0.004%)	749 (0.189%)	135 (0.034%)	898 (0.226%)
1990	1992	727,251	11 (0.002%)	96 (0.013%)	12 (0.002%)	119 (0.016%)
1991	1993	343,437	1 (0.0003%)	7 (0.002%)	3 (0.001%)	11 (0.003%)
1992	1994	305,813	21 (0.007%)	113 (0.037%)	128 (0.042%)	262 (0.086%)
1993	1995	722,906	86 (0.012%)	1,579 (0.218%)	217 (0.030%)	1,882 (0.260%)
1994	1996	333,794	7 (0.002%)	209 (0.063%)	57 (0.017%)	273 (0.082%)
1995	1997	16,598	2 (0.012%)	28 (0.169%)	11 (0.066%)	41 (0.247%)
1996	1998	76,846	73 (0.095%)	629 (0.819%)	1,366 (1.778%)	2,068 (2.691%)
1997	1999	684,165	978 (0.143%)	8,069 (1.179%)	531 (0.078%)	9,578 (1.400%)
1998	2000	449,454	57 (0.013%)	2,704 (0.602%)	1,304 (0.290%)	4,065 (0.904%)
1999	2001	80,430	29 (0.036%)	123 (0.153%)	97 (0.121%)	277 (0.344%)
2000	2002	549,861	128 (0.023%)	3,148 (0.573%)	73 (0.013%)	3,349 (0.609%)
2001	2003	597,063	57 (0.001%)	375 (0.063%)	70 (0.012%)	502 (0.084%)
2002	2004	643,503	67 (0.010%)	730 (0.113%)	235 (0.037%)	1,032 (0.160%)
2003	2005	624,967	9 (0.001%)	233 (0.037%)	93 (0.015%)	335 (0.054%)
2004	2006	637,334	415 (0.065%)	1,297 (0.204%)	82 (0.013%)	1,794 (0.281%)

Appendix Table 6 (Cont.)

Brood Year	Release Year	Smolts Released	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% Return)	Total (% Return)
2005	2007	569,565[2]	181 (0.0318%)	572 (0.100%)	231 (0.0290%)	984 (0.173%)
2006	2008	649,601	246 (0.0378%)	3,435 (0.529%)		
2007	2009	603,679[3]	262 (0.0434%)			
2008	2010	632,330				

Appendix Table 7. Historical age composition of the sport harvest of Dworshak NFH spring Chinook salmon by return year, 1997 to 2010.

Year	I-Ocean (BY)	II-Ocean (BY)	III-Ocean (BY)	Total Harvest
1997	0 (BY94)	693 (BY93)	0 (BY92)	693
1998	0 (BY95)	63 (BY94)	36 (BY93)	99
1999	0	0	0	0
2000	222 (BY97)	3,766 (BY96)	107 (BY95)	4,095
2001	28 (BY98)	6,712 (BY97)	1,615 (BY96)	8,355
2002	19 (BY99)	2,963 (BY98)	560 (BY97)	3,542
2003	78 (BY00)	212 (BY99)	1,938 (BY98)	2,228
2004	56 (BY01)	3,445 (BY00)	107 (BY99)	3,608
2005	3 (BY02)	494 (BY01)	1409(BY00)	606
2006	4 (BY03)	585 (BY02)	0 (BY01)	589
2007	0 (BY04)	148 (BY03)	108 (BY02)	256
2008	166 (BY05)	846 (BY04)	97 (BY03)	1,109
2009	744(BY06)	629 (BY05)	0 (BY04)	1,373
2010	37 (BY07)	1,397 (BY06)	42 (BY05)	1,476

Appendix Table 8. Historical age composition of the Tribal harvest of Dworshak NFH spring Chinook salmon by return year, 1997 to 2010.

Year	I-Ocean (BY)	II-Ocean (BY)	III-Ocean (BY)	Total Harvest
1987	2 (BY84)	128 (BY83)	30 (BY82)	160
1988	19 (BY85)	70 (BY84)	151 (BY83)	240
1989	31 (BY86)	270 (BY85)	45 (BY84)	346
1990	2 (BY87)	478 (BY86)	34 (BY85)	514
1991	0	0	0	0
1992	10 (BY89)	131 (BY88)	19 (BY87)	160
1993	0	24 (BY89)	19 (BY88)	43
1994	0	0	0	0
1995	0	0	0	0
1996	7 (BY93)	16 (BY92)	1 (BY91)	24
1997	3 (BY94)	635 (BY93)	197 (BY92)	835
1998	2 (BY95)	35 (BY94)	145 (BY93)	182
1999	30 (BY96)	4 (BY95)	2 (BY94)	36
2000	82 (BY97)	1,056 (BY96)	35 (BY95)	1,173
2001	5 (BY98)	425 (BY97)	101 (BY96)	531
2002	24 (BY99)	548 (BY98)	222 (BY97)	794
2003	246 (BY00)	202 (BY99)	997 (BY98)	1,445
2004	25 (BY01)	369 (BY00)	25 (BY99)	419
2005	8 (BY02)	80 (BY01)	14 (BY00)	102
2006	20 (BY03)	329 (BY02)	43 (BY01)	392
2007	65 (BY04)	78 (BY03)	55 (BY02)	198
2008	21 (BY05)	125 (BY04)	13 (BY03)	159
2009	97 (BY06)	221 (BY05)	36 (BY04)	354
2010	12 (BY07)	779 (BY06)	281 (BY05)	1,072

Appendix Table 9. Historical age composition of the Sport harvest of Kooskia NFH spring Chinook salmon by return year, 1997 to 2009.

Year	I-Ocean (BY)	II-Ocean (BY)	III-Ocean (BY)	Total Harvest
1997	0 (BY94)	45 (BY93)	0 (BY92)	45
1998	0 (BY95)	0 (BY94)	0 (BY93)	0
1999	0	0	0	0
2000	0 (BY97)	21 (BY96)	0 (BY95)	21
2001	21 (BY98)	5,139 (BY97)	1,237 (BY96)	6397
2002	8 (BY99)	1,292 (BY98)	244 (BY97)	1544
2003	15 (BY00)	40 (BY99)	371 (BY98)	426
2004	34 (BY01)	2,096 (BY00)	65 (BY99)	2195
2005	0 (BY02)	43 (BY01)	10 (BY00)	53
2006	0 (BY03)	53 (BY02)	20 (BY01)	73
2007	85 (BY04)	43 (BY03)	0 (BY02)	128
2008	57 (BY05)	546 (BY04)	20 (BY03)	623
2009	79 (BY06)	109 (BY05)	0 (BY04)	188
2010	28 (BY07)	1,261 (BY06)	38 (BY05)	1,327

Appendix Table 10. Historical age composition of the Tribal harvest of Kooskia NFH spring Chinook salmon by return year, 1997 to 2010.

Year	I-Ocean (BY)	II-Ocean (BY)	III-Ocean (BY)	Total Harvest
1987	1 (BY84)	44 (BY83)	5 (BY82)	50
1988	5 (BY85)	44 (BY84)	23 (BY83)	72
1989	6 (BY86)	43 (BY85)	9 (BY84)	58
1990	1 (BY87)	105 (BY86)	24 (BY85)	130
1991	na	na	na	na
1992	na	na	na	na
1993	na	na	na	na
1994	na	na	na	na
1995	na	na	na	na
1996	na	na	na	na
1997	0 (BY94)	11 (BY93)	1 (BY92)	12
1998	1 (BY95)	9 (BY94)	10 (BY93)	20
1999	1 (BY96)	0 (BY95)	0 (BY94)	1
2000	6 (BY97)	4 (BY96)	0 (BY95)	10
2001	8 (BY98)	793 (BY97)	33 (BY96)	834
2002	7 (BY99)	560 (BY98)	116 (BY97)	683
2003	16 (BY00)	12 (BY99)	136 (BY98)	164
2004	8 (BY01)	370 (BY00)	11 (BY99)	389
2005	19 (BY02)	130 (BY01)	24 (BY00)	173
2006	1 (BY03)	60 (BY02)	4 (BY01)	65
2007	73 (BY04)	42 (BY03)	51 (BY02)	166
2008	17 (BY05)	104 (BY04)	11 (BY03)	132
2009	12 (BY06)	94 (BY05)	17 (BY04)	123
2010	12 (BY07)	1.072 (BY06)	72 (BY05)	1,156